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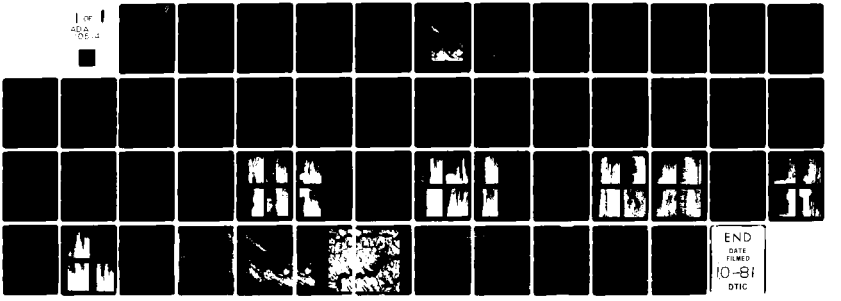

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MISSISSIPPI-KASKASKIA-ST. LOUIS BASIN

LAKE VIRGINIA DAM

JEFFERSON COUNTY, MISSOURI

MO 30425

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10 Henry M. /Reitz John J. /Bailey, Jr

PHASE 1 INSPECTION REPORT

6 NATIONAL DAM SAFETY PROGRAM.

Lake Virginia Dam (MO 30425),
Mississippi - Kaskaskia - St. Louis Basin,
Jefferson County, Missouri. Phase I
Inspection Report.

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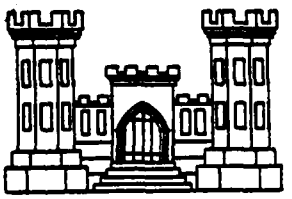

PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

NOVEMBER 1978

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Lake Virginia Dam, MO ID No. 30425
Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Lake Virginia Dam:

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

1) Spillway will not pass 15 percent of the Probable Maximum Flood.
2) Overtopping could result in dam failure.
3) Dam failure significantly increases the hazard to loss of life downstream.

SUBMITTED BY: SIGNED
Chief, Engineering Division

12 MAR 1979
Date

APPROVED BY: _____
Colonel, CE, District Engineer

12 MAR 1979
Date

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PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam	Lake Virginia Dam
State Located	Missouri
County Located	Jefferson County
Stream	Unnamed Tributary of Joachim Creek
Date of Inspection	1 and 10 November and 27 and 31 October 1978

Lake Virginia Dam was inspected by an interdisciplinary team of engineers from Reitz & Jens, Inc. under contract with the St. Louis District Corps of Engineers. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection to determine if the dam poses hazards to human life and property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and State agencies, professional engineering organizations and private engineers. Based on these guidelines, this dam is classified as a small size dam with a high downstream hazard potential. The estimated damage zone from failure extends three miles downstream from the dam.

Failure would threaten the life and property of three families and cause appreciable damage to associated farm buildings,one railroad crossing and one improved road.

Our inspection and evaluation indicates that the dam is deficient in that the spillways do not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. Considering the small volume of water impounded, the floodplain downstream and the three groups of buildings downstream, one-half Probable Maximum Flood (PMF) is the appropriate spillway design flood. The probable maximum flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorological and hydrologic conditions reasonably possible in the region. The dam will begin to be overtopped by a flood having a discharge (peak and volume) equal to 15% of the PMF. The dam will start to be overtopped by a 1% chance flood (100-year flood) which is a flood that has a 1% chance of being exceeded in any given year.

Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency. Other deficiencies observed by the inspection team were presence of trees on the downstream slope and an oxidation pond at the toe of the dam.

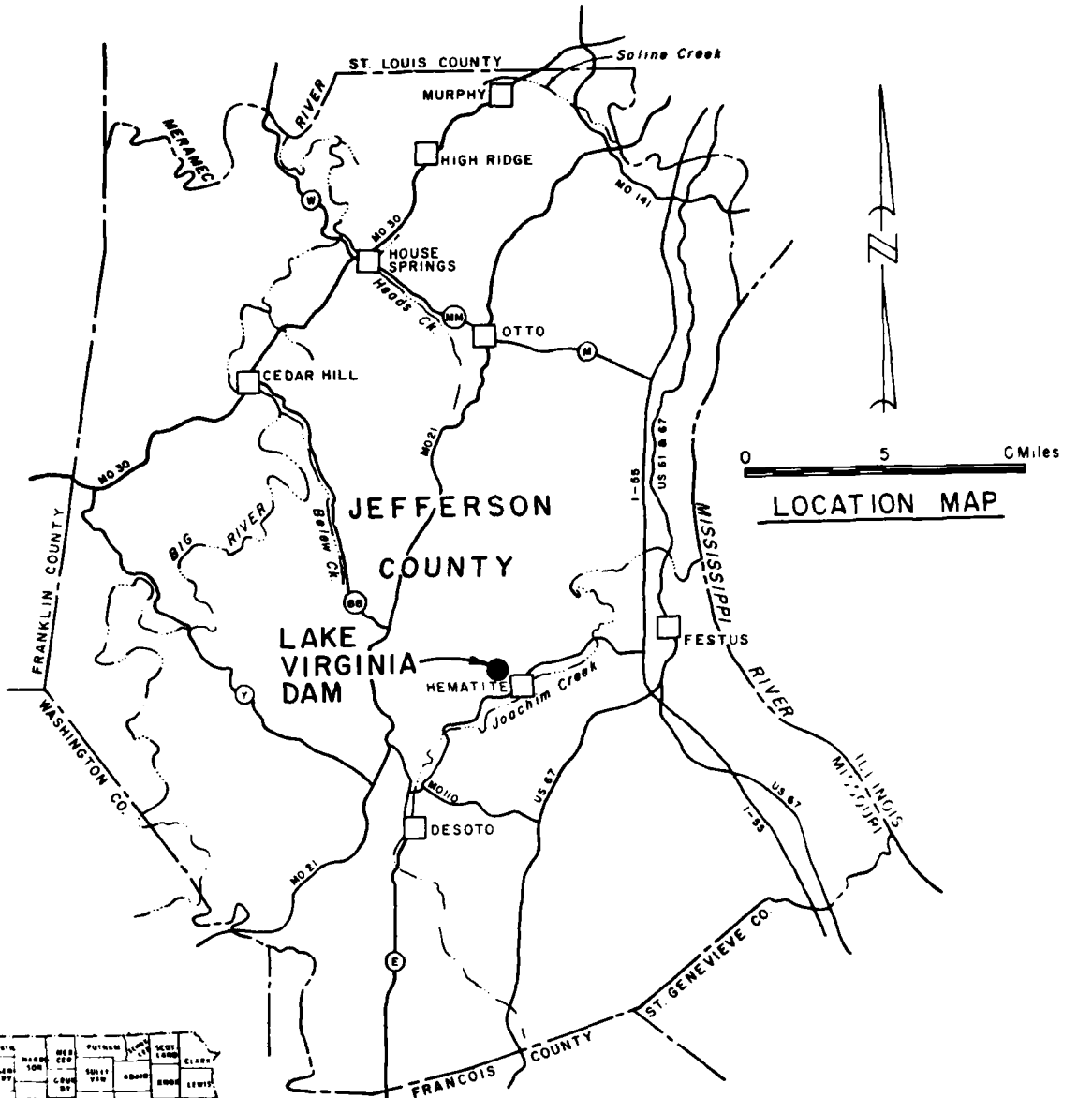
We recommend the owner take prompt action to correct or control the deficiencies described. A detailed discussion of each deficiency is included in the following report.

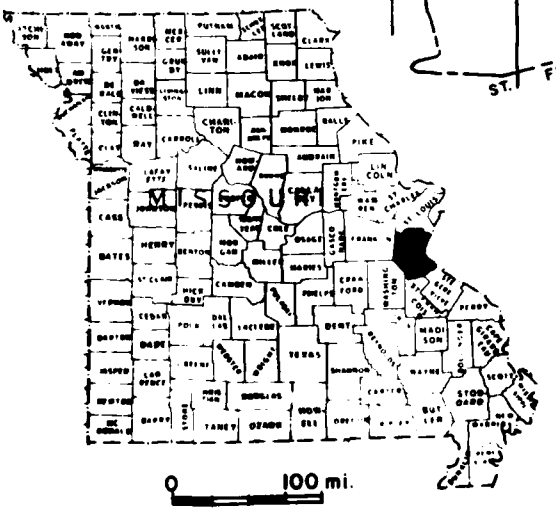
HENRY M. REITZ, President
Reitz & Jens, Inc.

JOHN J. BAILEY, JR., Vice President
Chief Engineer
Reitz & Jens, Inc.

OVERVIEW-30425

PLATE 1





VICINITY MAP

PLATE 2

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
Lake Virginia Dam, MO ID No. 30425

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(Cont.)

LIST OF PLATES

LIST OF INDICES AND PHOTOGRAPH NUMBERS

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer contracted with Reitz & Jens, Inc. (Contract DACW43-78-C-0162) for a safety inspection of the Lake Virginia Dam, MO ID No. 30425.

b. Purpose of Inspection The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed with the help of several Federal agencies and many State agencies, professional engineering organizations and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances The dam is an earth structure built across an unnamed tributary to Joachim Creek in the hills on the north side of the Joachim Creek floodplain. The drainage area consists of 80% steeply rolling hilly ground covered with Union Silt Loam soils. At times a portion of the area, especially on the ridges, was cultivated. Currently, most of this land is in pasture or woods. The remaining 20% of the watershed, especially in the northeast upper reaches, consists of steep stony land with sparse tree growth. There is a small cattle pond in the southwest portion of the watershed that receives runoff from about 45 acres of the watershed.

Topography in the vicinity of the dam is shown on Plate 3.

Pertinent physical data are given in paragraph 1.3 below.

b. Location The dam is located in the east south-central portion of Jefferson County about one-half mile northwest of the town of Hematite as shown on Plate 2. The dam and lake are located in the SW¼ of Section 8, T40N, R5E, and are shown on the Missouri Jefferson County, Festus Quadrangle sheet.

c. Size Classification Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1.c above. Based on these criteria, this dam and impoundment is in the small size category.

d. Hazard Classification Guidelines for determining hazard classification are presented in the same guidelines referenced in paragraph c above. Based on referenced guidelines, this dam is in the High Hazard Classification.

e. Ownership The dam is owned by the Trustees of Lake Virginia Subdivision: William Jewell Jones and Virginia N. Jones, Box 69, Hematite, Missouri, 63047.

f. Purpose of Dam The dam forms a 25-acre (at full pool) recreational lake.

g. Design and Construction History The inspection team was unable to find any design data on this dam. Mr. Jones reported that the dam was built in 1954 (see paragraph 2.2).

h. Normal Operating Procedure The reservoir appears to be subject to severe water loss from leakage through either the sides or bottom or both. The water level appears to fluctuate widely in response to variations in runoff. The maximum water depth ever experienced at the spillway is unknown although there appears to have been discharge from the reservoir through the spillway at some time in the past.

1.3 PERTINENT DATA

a. Drainage Area - 475 acres

b. Discharge at Damsite -

(1) All discharge at the damsite is through an uncontrolled spillway.

(2) Estimated experienced maximum flood at damsite - unknown.

(3) Estimated ungated spillway capacity at maximum pool elevation -

(a) southwest spillway - 170 cfs

(b) Northeast spillway - 0 cfs

(c) Total - 170 cfs

c. Elevation (Feet Above M.S.L.)

(1) Top of dam - 469.2 to 470.6 (see Plate 3).

(2) Spillway crest - 465.5

(3) Streambed at centerline of dam - 444.5 (from survey).

(4) Maximum tailwater - unknown.

d. Reservoir - Length of pool at spillway crest - 1,500 feet (from clearing indicated on air photos).

Length of maximum pool - 1,600 + feet.

e. Storage (Acre-Feet) -

(1) Top of dam - 273 acre feet (estimated).

(2) Spillway crest - 176 acre feet.

f. Reservoir Surface (Acres) -

(1) Top of dam - 28.9 acres (estimated).

(2) Spillway crest - 25.7 acres (measured on aerial photo).

g. Dam

(1) Type - earth embankment

(2) Length - 700 feet

(3) Height - 26.1 feet maximum (from survey).

(4) Top width - 18± feet.

(5) Side Slopes -

(a) Downstream - 1V on 2.5H (determined from section at Station 4+00, plate 3).

(b) Upstream - 1V on 2.8H (from section at Station 4+00).

(6) Zoning - unknown

(7) Impervious Core - see paragraph 2.2.

(8) Cutoff - see paragraph 2.2.

(9) Grout curtain - unknown.

h. Diversion and Regulating Tunnel - None

i. Spillways

(1) Southwest spillway:30-40 feet wide, 3½-foot deep channel cut into side of valley from about 100 feet above centerline of dam to about 100 feet below centerline of dam.

(2) Northeast spillway: notch at end of dam. Flowline about level with lowest part of crest of dam.

j. Regulating Outlets - None

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No design data were found to be readily available.

2.2 CONSTRUCTION

Mr. William Jewel Jones, one of the subdivision Trustees, told a member of the inspection team that he observed construction of the dam in 1954. He said a 16-foot wide trench was cut to bedrock for a core but the entire dam was built out of red clay and rolled with a sheepsfoot roller.

2.3 OPERATION

The maximum loading on the dam is unknown. The lake level seems to fluctuate with the amount of runoff from the drainage area. Mr. Jones said the lake filled after construction and, at one time, the southwest spillway flowed nearly full. The reservoir seems to drain through a crack or sinkhole in the bottom of the lake.

There are no written records of operation of the dam.

It appears, from the condition of the southwest spillway, that water from the reservoir has flowed through it at some time since completion.

2.4 EVALUATION

a. Availability Engineering data were not available.

b. Adequacy Since no engineering data were available, a detailed assessment of design, construction and operation could not be made. The owner should have an engineer, experienced in the design of dams, perform detailed seepage and stability analyses.

However, for the methods used in collecting and evaluating data, it was possible to perform satisfactory hydrologic/hydraulic computations and evaluations.

c. Validity This report is primarily for safety through maintenance and operation and the conclusions and evaluation for this Phase I Inspection are considered adequate for the definitive statement in this report.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General A visual inspection of the Lake Virginia dam was made on 10 November 1978. This followed three days of field measurements by a survey party on 27 and 31 October and 1 November 1978. The training and experience of personnel in these inspections included hydraulic/hydrologic engineering, soils and materials engineering, surveying and structural engineering. Specific observations are discussed below.

b. Dam Elevation of the top of the dam varies about two feet. The dam is an earth dam. Top width approximately 18 feet (D-6). Downstream slope - 1V on 2.5H (D-3,D-4,D-5). Upstream slope - 1V on 2.8H (D-1,D-2).

During field inspections and surveys the reservoir was completely dry except for a small "puddle" no more than 1-1/2 feet deep (P-3,P-4). Much of the lake bottom appears to have been cultivated during the growing season of 1978. Both downstream (D-3,D-4) and upstream (D-1,D-2,D-5) surfaces were covered with grass and considered in exceptionally good condition. A row of red cedars (junipers) had been planted along the downstream top edge of the dam (D-1 thru D-6). Discussions with the resident immediately downstream, who appears to have been the owner-developed for the intended reservoir, noted that in the first several years the reservoir did fill sufficiently to have flow over the spillway but apparently, the head from a full reservoir caused piping with loss of soil into strata beneath the reservoir. The areas with piping have caused downward erosion of at least a portion of the fine-grained portion of the soil on the reservoir bottom. Continuing leakage has resulted in the currently empty reservoir.

Inspection of the downstream slope of the dam and contiguous areas beyond the toe of the dam, must recognize the presence of an oxidation pond in the center of the valley closely adjacent to the toe of the dam.

Visual observations for indications of existing seepage were by inspection of the downstream slope of the dam and contiguous areas beyond its toe. No hydrophilic plant growth nor any wet areas were found. While it is apparent the reservoir has not stayed full or nearly full following wet seasons, the absence of any signs indicating seepage just mentioned can be the direct result of low lake levels. Consequently, the dry downslope portions of the dam with the low reservoir area do not assure freedom from through-seepage or under-seepage potentials.

No surface indications of slides on the slopes or cracking in the dam section were found. The lower portion of the dam between Stations 4+50 and 8+00 probably resulted from settlement in the higher part of the dam embankment. No actual sinkholes were seen or known to be in the general proximity. No digging or burrowing animal activity was observed.

c. Spillways There is no low-level outlet visible. The spillway is at the southwest end of the dam. At the northeast end the local change in topography suggests a spillway (S-1); however, the low point at the northeast end of the dam is essentially the same elevation as the low point on the main dam embankment which occurs approximately 150 feet onto the dam from the edge of

the southwest spillway. The southwest spillway is excavated through the virgin soil (S-2) and has bedrock (though somewhat shattered S-3) visible in the bottom of the spillway (S-4,S-5) section. The spillway is approximately 250 feet long, essentially flat, and roughly symmetrical about the centerline of the dam.

Downstream from the dam embankment, excavation from the spillway has been pushed northward into the trees to define somewhat of a channel (S-5,S-6,S-7) and direct the discharge from the spillway down the valley to below the oxidation pond, rather than allow it to run downslope as soon as its path had cleared the end of the dam.

No locations of piping were observed either near the toe of the dam or down-valley from the dam. If piping exits into the sewage lagoon at the toe of the dam, its specific points cannot be identified since discharge from the earth section is underwater.

While there has not been enough flow to develop erosion paths that might be the result of valley runoff through the spillway, the nature of the materials exposed in the bottom of the spillway indicates no reason for concern for troublesome erosion along the emergency spillway.

d. Reservoir Area The reservoir area is effectively empty. Photos under seepage (SE-1 thru SE-3) show the culture that has developed in the reservoir area. No areas permitting leakage from the reservoir could be identified.

e. Downstream Channel The channel drains southwesterly through a rather wide valley that has single-family residences. Overtopping or failure of the dam would cause downstream pollution because these discharges would flow through the oxidation pond and carry its contents downstream. Approximately one-half mile downstream from the dam, the valley crosses Missouri Highway 21. One-fourth mile down-valley beyond 21A, the discharge enters Joachim Creek.

3.2 EVALUATION

Site observations show a wholly unsatisfactory lake development as far as the amenities and benefits to be anticipated. The site conditions which prevent filling the lake and keeping it relatively full, prevent assessment of potential seepage and bank erosion. The bottom of the spillway appears to have adequate resistance to erosion from reservoir discharges. The presence of the oxidation pond at the toe of the dam is a safety deficiency in that underseepage at the location of this pond would not be detected because the presence of the sewage being treated would mask any evidence of such seepage flows.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no controlled outlet works for this dam; therefore, no regulating procedures exist. The pool is controlled by rainfall, runoff, evaporation and leakage through the bottom of the reservoir.

4.2 MAINTENANCE OF DAM

The dam has well developed turf on both upstream and downstream slopes. The slopes seem to be mowed at frequent intervals. There is a row of cedar trees planted on the top of the dam at the top of the downstream slope.

4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities exist at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

The inspection team is not aware of any existing warning system for this dam.

4.5 EVALUATION

The growth of cedar trees near the crest of the dam is a safety deficiency that, if allowed to continue, may eventually develop into a major safety deficiency. Trees provide shelter and habitat for burrowing animals whose activity may eventually cause seepage through the dam embankment.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data No design data are available.

b. Experience Data The drainage area is developed from USGS Festus Missouri Quadrangle. Also available are 1"=2000' aerial stereo pairs taken 8 April 1977, by Surdex Corp. Lake area is measured on a 1"=200' enlargement of a portion of one of these photographs and shown on Plate 1. The spillway and dam layout are from surveys made during the inspection.

c. Visual Observations

(1) The spillway and exit channel are located at the southwest end of the dam.

(2) The spillway and exit channel are in good condition.

(3) The spillway at the northeast end of the dam is too high relative to the low point of the dam crest to be effective.

(4) No drawdown facilities are available to evacuate the pool.

(5) Maximum spillway releases may endanger the integrity of the dam (see paragraph 3.2.b). The spillway berm below the dam will overflow prior to overtopping the dam. This discharge may erode the berm and cause erosion of the dam embankment adjacent to the spillway.

d. Overtopping Potential

(1) The spillways are too small to pass the minimum required flood of one-half the Probable Maximum without overtopping. The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The dam will start to be overtopped by a flood equal to 15% of the PMF. The one-half PMF will overtop the dam to a maximum depth of about 2.1 feet. The depth will vary to zero across the dam because of the sloping crest. The entire width of dam crest will be subject to some overtopping flow. Maximum rate of flow over the dam crest will be about 2700 cubic feet per second. Overtopping flow will have a duration of about 8 hours. The dam will start to be overtopped by a 100-year flood. Overtopping would erode the downstream face of the dam. A consequence of erosion of this would be release of impounded water with increased hazard down-valley.

According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, the 100-year frequency flood is only adequate for a low hazard dam of small size.

(2) At the current pool elevation, 30 feet below the spillway crest, the lake has capacity to retain a one-day 100-year flood without reaching the spillway crest. Assuming a start at the current pool elevation, overtopping of the dam would begin to occur for a flood equal to 25% of the one-day PMF. Because a drawdown tube is absent, there is no assurance the pool will remain at the current elevation. In the future, it is possible that the reservoir will

be full at the beginning of a period of intense rainfall. Therefore, the statements in this paragraph cannot justify the lack of adequate spillways but can be used to evaluate the urgency for necessary corrections.

(3) Failure of the upstream water impoundment described in paragraph 1.2.a would not have a significant impact on the hydrologic or hydraulic analysis.

(4) The effect from rupture of the dam could extend approximately three miles downstream of the dam. There are five inhabited homes downstream of the dam which could be severely damaged and lives of the inhabitants lost should failure of the dam occur.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations Visual observations which affect the structural stability of this dam are discussed in Section 3, paragraph 3.1.b.

b. Design and Construction Data No design or construction data relating to the structural stability of the dam were found. Seepage and stability analyses of the slopes were not found.

c. Operating Records No appurtenant structures requiring operation exist at this dam.

d. Post Construction Changes No post construction changes exist which will affect the structural stability of the dam. The row of cedars on the dam is not a potential source of maintenance or concern. The clear areas beneath the small spread of the trees with the cutting of grass on the surfaces of the dam discourages underbrush growth and animal activity.

e. Seismic Stability Considering the seismic zone (2) in which this dam is located, an earthquake of this magnitude is not expected to cause a structural failure of this dam.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety The spillway is inadequate to pass the required one-half Probable Maximum Flood (PMF).

The reservoir and principal spillway are almost adequate to contain a flood which has a 1% chance of being exceeded (100-year flood) in any given year.

Several items were noted during the visual inspection by the inspection team which should be corrected or controlled. The row of cedar trees on the downstream slope of the dam is a safety deficiency. The oxidation pond at the toe of the dam would prevent observation of underseepage.

Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency.

b. Adequacy of Information Due to the lack of engineering design and construction data, the conclusions in this report were based on performance history and external visual conditions. The inspection team considers these data sufficient to support the conclusions herein.

c. Urgency The remedial measures recommended in paragraph 7.2 should be accomplished in the near future. If the safety deficiencies listed in paragraph a are not corrected in the near future, they will continue to deteriorate and lead to a serious potential of failure.

d. Necessity for Phase II Based on the results of the Phase I Inspection, no Phase II Inspection is recommended.

e. Seismic Stability This dam is located in Seismic Zone 2. An earthquake of this magnitude is not expected to be hazardous to this dam.

7.2 REMEDIAL MEASURES

a. Alternatives

(1) Spillway size and/or height of dam should be increased to pass the one-half probable maximum flood. The owner should obtain the services of an experienced engineer to design and observe construction of remedial measures.

(2) The owner should move the oxidation pond at the toe of the dam a sufficient distance downstream so inspections can be made for underseepage.

b. Stability and Seepage Analyses The owner should have an engineer experienced in the design and construction of dams prepare seepage and stability analyses. This should be done in conjunction with design of the remedial measures set out in paragraph 7.2.a.

c. O&M Maintenance and Procedures The following O&M maintenance and procedures are recommended:

(1) Remove cedar trees growing on the downstream slope of the dam.

(2) Continue mowing dam at sufficient intervals to control growth of vegetation.

(3) After completion of the remedial measures, detailed inspections of the dam should be made periodically by an engineer experienced in design and construction of dams. Records should be kept of these inspections and major maintenance.

d. Reservoir Leakage Leaking from the reservoir does not adversely affect the stability of the dam. Therefore, remedial measures are not a requirement of a Phase I report. The inability to maintain a lake level as desired is a definite (but separate from Phase I hazard assessment) concern to the owner.

APPENDIX A

HYDROLOGIC CALCULATIONS

HYDROLOGIC AND HYDRAULIC ANALYSIS METHODOLOGY

1. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for a reservoir routing. The Probable Maximum Precipitation for those dams in the high hazard potential category is derived and determined from regional charts prepared by the National Weather Service in "Hydrometeorological Report No. 33". Reduction factors have not been applied. A 24-hour storm duration is assumed with the 24-hour rainfall depths distributed over 6-hour periods in accordance with procedures outlined in EM 1110-2-1411 (SPF Determination). The maximum 6-hour rainfall period is then distributed to hourly increments by the same criteria. Within-the-hour distribution is based upon NOAA Technical Memorandum NWS HYDRO-35. The non-peak 6-hour rainfall periods are distributed uniformly. All distributed values are arranged in a critical sequence by the SPF criteria. The final inflow hydrograph is produced by deduction of infiltration losses appropriate to the soil, land use and antecedent moisture conditions.

2. The reservoir routing is accomplished by using Modified Puls routing techniques wherein the flood hydrograph is routed through lake storage. Hydraulic capacities of the spillways and crest of dam are used as outlet controls in the routing. Storage in the pool area is defined by an elevation-area curve. The hydraulic capacity of the spillways and the sloping top of dam is defined by a composite elevation discharge curve.

3. Dam overtopping analysis has been conducted by hydrologic methods for this dam and lake. This computation determines the percentage of the PMF hydrograph that the reservoir can contain without the dam being overtopped. An output summary in the hydrologic appendix displays this information as well as other characteristics of the simulated dam overtopping.

4. The above methodology has been accomplished for this report using the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. The numeric parameters estimated for this site are listed on Plate 1. Definitions of these variables are contained in the "User's Manual" for the computer program.

5. The capacity of the south spillway was calculated using critical velocity at the control section at the lower end of the 400± foot long spillway channel. A drawdown curve taking into account velocity head changes and friction was then calculated up the channel to determine the corresponding lake elevation.

6. The capacity of the north spillway was calculated using critical velocity at the control section at the centerline of the dam. To allow for friction, velocity distribution and transition losses, 0.2 velocity head was added. Flow over the sloping top of the dam was calculated using a coefficient of discharge of 3.0 in the broad-crested weir equation.

7. Discharge over the irregular top of dam (the crest is not level) was calculated using a coefficient of 3.0 in the broad-crested weir equation for the sections of dam crest at different elevations. All spillway and overtopping discharges were included in a composite rating curve. Dummy values of 0.1 for dam length, coefficient of discharge and exponent were entered on the $D card to suppress diagnostic statements in the output. The amount of this dummy flow is never greater than 0.02 cfs.

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  3 AUG 78
**********
    1                 A  ********** ID # 30425 LAKE VIRGINIA DAM ******************************
    2                 A  ********** DAM SAFETY PROGRAM - U. S. CORPS OF ENGINEERS **********
    3                 A  ********** REITZ & JENS, INC. -    AUGUST 1978 **********************
    4                 B    288       0        5       -0       -0       -0       -0       -0       -4       -0
    5                 I      5
    6                 J      1        9        1
    7                 J1  0.10     0.15     0.20     0.25     0.30     0.35     0.40     0.50     1.00
    8                 K      0    PMF                          1        3        1
    9                 1  ***** INFLOW HYDROGRAPH - SCS METHOD *****
   10                 M      1        2    0.742                          1                          1
   11                 P              25.7      101      120      130
   12                 T                                                          -1      -87              0.09
   13                 W2             0.23
   14                 X             -0.10      2.0
   15                 K      1       13                          1                1
   16                 1  ***** RESERVOIR ROUTING - PIPE & SPILLWAY EQUATIONS - SLOPING DAM *****
   17                 Y                                       1        1
   18                 Y1     1                                                 -465.5       -1
   19                 Y4  465.5    466.0    466.5    467.0    467.5    468.0    468.5    469.0    469.5    470.0
   20                 Y4  470.5    471.0    471.5
   21                 Y5    0.0      4.0     13.0     28.5     50.0     78.5    112.0    152.0    244.0    579.0
   22                 Y51315.0   2504.0   4221.0
   23                 $A    0.0     25.71     41.8     78.9
   24                 $F    444       466      480      500
   25                 $$  465.5
   26                 $D  469.1       0.1      0.1      0.1
   27                 K      99
```

PLATE A-1
Sheet 1 of 5

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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  3 AUG 78
**********************************

RUN  DATE= 12/18/78.
     TIME= 14.17.44.
```

* ********** ID # 30425 LAKE VIRGINIA DAM **********
********** DAM SAFETY PROGRAM - U. S. CORPS OF ENGINEERS **********
********** REITZ & JENS, INC. - AUGUST 1978 **********

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	5	-0	-0	-0	-0	-0	-4	-0
			JOPER	NWT	LROPT	TRACE			
			5	-0	-0	-0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS=	.10	.15	.20	.25	.30	.35	.40	.50	1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

***** INFLOW HYDROGRAPH - SCS METHOD *****

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
PMF	0	-0	-0	1	3	1	-0	-0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.74	-0.00	.74	1.00	-0.000	-0	1	-0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
-0.00	25.70	101.00	120.00	130.00	-0.00	-0.00	-0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
-0	-0.00	-0.00	1.00	-0.00	-0.00	1.00	-1.00	-87.00	-0.00	.09

CURVE NO = -87.00 WETNESS = -1.00 EFFECT CN = 87.00

UNIT HYDROGRAPH DATA
TC= -0.00 LAG= .23

RECESSION DATA
STRTQ= -0.00 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH 16 END OF PERIOD ORDINATES, TC= -0.00 HOURS, LAG= .23 VOL= 1.00

261.	899.	1308.	1201.	843.	482.	298.	180.	109.	64.
40.	24.	15.	10.	5.	1.				

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

PLATE A-1
Sheet 2 of 5

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	.00	.01	0.	1.01	12.05	145	.22	.21	.01	410.
1.01	.10	2	.01	.00	.01	1.	1.01	12.10	146	.22	.21	.01	539.
1.01	.15	3	.01	.00	.01	3.	1.01	12.15	147	.22	.21	.01	726.
1.01	.20	4	.01	.00	.01	5.	1.01	12.20	148	.22	.21	.01	899.
1.01	.25	5	.01	.00	.01	6.	1.01	12.25	149	.22	.21	.01	1021.
1.01	.30	6	.01	.00	.01	6.	1.01	12.30	150	.22	.21	.01	1092.
1.01	.35	7	.01	.00	.01	7.	1.01	12.35	151	.22	.21	.01	1137.
1.01	.40	8	.01	.00	.01	7.	1.01	12.40	152	.22	.21	.01	1164.
1.01	.45	9	.01	.00	.01	7.	1.01	12.45	153	.22	.21	.01	1182.
1.01	.50	10	.01	.00	.01	7.	1.01	12.50	154	.22	.21	.01	1193.
1.01	.55	11	.01	.00	.01	7.	1.01	12.55	155	.22	.21	.00	1201.
1.01	1.00	12	.01	.00	.01	7.	1.01	13.00	156	.22	.21	.00	1206.
1.01	1.05	13	.01	.00	.01	7.	1.01	13.05	157	.26	.25	.01	1220.
1.01	1.10	14	.01	.00	.01	7.	1.01	13.10	158	.26	.25	.01	1261.
1.01	1.15	15	.01	.00	.01	7.	1.01	13.15	159	.26	.25	.00	1319.
1.01	1.20	16	.01	.00	.01	7.	1.01	13.20	160	.26	.25	.00	1371.
1.01	1.25	17	.01	.00	.01	7.	1.01	13.25	161	.26	.26	.00	1409.
1.01	1.30	18	.01	.00	.01	7.	1.01	13.30	162	.26	.26	.00	1430.
1.01	1.35	19	.01	.00	.01	7.	1.01	13.35	163	.26	.26	.00	1444.
1.01	1.40	20	.01	.00	.01	7.	1.01	13.40	164	.26	.26	.00	1453.
1.01	1.45	21	.01	.00	.01	7.	1.01	13.45	165	.26	.26	.00	1459.
1.01	1.50	22	.01	.00	.01	7.	1.01	13.50	166	.26	.26	.00	1463.
1.01	1.55	23	.01	.00	.01	8.	1.01	13.55	167	.26	.26	.00	1466.
1.01	2.00	24	.01	.00	.01	8.	1.01	14.00	168	.26	.26	.00	1468.
1.01	2.05	25	.01	.00	.01	9.	1.01	14.05	169	.32	.32	.00	1486.
1.01	2.10	26	.01	.00	.01	10.	1.01	14.10	170	.32	.32	.00	1545.
1.01	2.15	27	.01	.00	.01	11.	1.01	14.15	171	.32	.32	.00	1630.
1.01	2.20	28	.01	.00	.01	12.	1.01	14.20	172	.32	.32	.00	1708.
1.01	2.25	29	.01	.00	.01	13.	1.01	14.25	173	.32	.32	.00	1763.
1.01	2.30	30	.01	.00	.01	14.	1.01	14.30	174	.32	.32	.00	1795.
1.01	2.35	31	.01	.00	.01	16.	1.01	14.35	175	.32	.32	.00	1815.
1.01	2.40	32	.01	.00	.01	17.	1.01	14.40	176	.32	.32	.00	1827.
1.01	2.45	33	.01	.00	.01	18.	1.01	14.45	177	.32	.32	.00	1835.
1.01	2.50	34	.01	.00	.01	19.	1.01	14.50	178	.32	.32	.00	1840.
1.01	2.55	35	.01	.00	.01	20.	1.01	14.55	179	.32	.32	.00	1843.
1.01	3.00	36	.01	.00	.01	21.	1.01	15.00	180	.32	.32	.00	1846.
1.01	3.05	37	.01	.00	.01	22.	1.01	15.05	181	.20	.20	.00	1814.
1.01	3.10	38	.01	.00	.01	23.	1.01	15.10	182	.39	.39	.00	1753.
1.01	3.15	39	.01	.00	.01	24.	1.01	15.15	183	.39	.39	.00	1765.
1.01	3.20	40	.01	.00	.01	25.	1.01	15.20	184	.59	.59	.00	1921.
1.01	3.25	41	.01	.01	.01	26.	1.01	15.25	185	.69	.69	.00	2252.
1.01	3.30	42	.01	.01	.01	27.	1.01	15.30	186	1.68	1.67	.01	2958.
1.01	3.35	43	.01	.01	.01	28.	1.01	15.35	187	2.76	2.75	.01	4544.
1.01	3.40	44	.01	.01	.01	29.	1.01	15.40	188	1.09	1.08	.00	6684.
1.01	3.45	45	.01	.01	.01	30.	1.01	15.45	189	.69	.69	.00	7875.
1.01	3.50	46	.01	.01	.01	30.	1.01	15.50	190	.59	.59	.00	7560.
1.01	3.55	47	.01	.01	.01	31.	1.01	15.55	191	.39	.39	.00	6360.
1.01	4.00	48	.01	.01	.01	32.	1.01	16.00	192	.39	.39	.00	5034.
1.01	4.05	49	.01	.01	.01	33.	1.01	16.05	193	.30	.30	.00	4024.
1.01	4.10	50	.01	.01	.01	34.	1.01	16.10	194	.30	.30	.00	3253.
1.01	4.15	51	.01	.01	.01	34.	1.01	16.15	195	.30	.30	.00	2697.
1.01	4.20	52	.01	.01	.01	35.	1.01	16.20	196	.30	.30	.00	2327.
1.01	4.25	53	.01	.01	.01	36.	1.01	16.25	197	.30	.30	.00	2092.
1.01	4.30	54	.01	.01	.01	36.	1.01	16.30	198	.30	.30	.00	1952.
1.01	4.35	55	.01	.01	.01	37.	1.01	16.35	199	.30	.30	.00	1867.
1.01	4.40	56	.01	.01	.01	38.	1.01	16.40	200	.30	.30	.00	1815.
1.01	4.45	57	.01	.01	.01	38.	1.01	16.45	201	.30	.30	.00	1779.
1.01	4.50	58	.01	.01	.01	39.	1.01	16.50	202	.30	.30	.00	1756.
1.01	4.55	59	.01	.01	.01	40.	1.01	16.55	203	.30	.30	.00	1744.
1.01	5.00	60	.01	.01	.01	40.	1.01	17.00	204	.30	.30	.00	1739.

1.01	5.00	60	.01	.01	.01	40.	1.01	17.00	204	.30	.30	.00	1739.
1.01	5.05	61	.01	.01	.01	41.	1.01	17.05	205	.24	.24	.00	1720.
1.01	5.10	62	.01	.01	.01	41.	1.01	17.10	206	.24	.24	.00	1661.
1.01	5.15	63	.01	.01	.01	42.	1.01	17.15	207	.24	.24	.00	1576.
1.01	5.20	64	.01	.01	.01	43.	1.01	17.20	208	.24	.24	.00	1498.
1.01	5.25	65	.01	.01	.01	43.	1.01	17.25	209	.24	.24	.00	1443.
1.01	5.30	66	.01	.01	.01	44.	1.01	17.30	210	.24	.24	.00	1412.
1.01	5.35	67	.01	.01	.01	44.	1.01	17.35	211	.24	.24	.00	1393.
1.01	5.40	68	.01	.01	.01	45.	1.01	17.40	212	.24	.24	.00	1381.
1.01	5.45	69	.01	.01	.01	45.	1.01	17.45	213	.24	.24	.00	1374.
1.01	5.50	70	.01	.01	.01	46.	1.01	17.50	214	.24	.24	.00	1370.
1.01	5.55	71	.01	.01	.01	46.	1.01	17.55	215	.24	.24	.00	1367.
1.01	6.00	72	.01	.01	.01	47.	1.01	18.00	216	.24	.24	.00	1366.
1.01	6.05	73	.07	.04	.03	56.	1.01	18.05	217	.02	.02	.00	1308.
1.01	6.10	74	.07	.04	.03	85.	1.01	18.10	218	.02	.02	.00	1114.
1.01	6.15	75	.07	.04	.02	130.	1.01	18.15	219	.02	.02	.00	831.
1.01	6.20	76	.07	.05	.02	173.	1.01	18.20	220	.02	.02	.00	744.
1.01	6.25	77	.07	.05	.02	205.	1.01	18.25	221	.02	.02	.00	694.
1.01	6.30	78	.07	.05	.02	227.	1.01	18.30	222	.02	.02	.00	647.
1.01	6.35	79	.07	.05	.02	243.	1.01	18.35	223	.02	.02	.00	604.
1.01	6.40	80	.07	.05	.02	255.	1.01	18.40	224	.02	.02	.00	564.
1.01	6.45	81	.07	.05	.02	265.	1.01	18.45	225	.02	.02	.00	526.
1.01	6.50	82	.07	.05	.02	273.	1.01	18.50	226	.02	.02	.00	491.
1.01	6.55	83	.07	.05	.02	280.	1.01	18.55	227	.02	.02	.00	458.
1.01	7.00	84	.07	.05	.02	286.	1.01	19.00	228	.02	.02	.00	427.
1.01	7.05	85	.07	.05	.01	291.	1.01	19.05	229	.02	.02	.00	398.
1.01	7.10	86	.07	.05	.01	296.	1.01	19.10	230	.02	.02	.00	372.
1.01	7.15	87	.07	.05	.01	300.	1.01	19.15	231	.02	.02	.00	347.
1.01	7.20	88	.07	.05	.01	304.	1.01	19.20	232	.02	.02	.00	324.
1.01	7.25	89	.07	.06	.01	308.	1.01	19.25	233	.02	.02	.00	302.
1.01	7.30	90	.07	.06	.01	311.	1.01	19.30	234	.02	.02	.00	282.
1.01	7.35	91	.07	.06	.01	315.	1.01	19.35	235	.02	.02	.00	263.
1.01	7.40	92	.07	.06	.01	318.	1.01	19.40	236	.02	.02	.00	245.
1.01	7.45	93	.07	.06	.01	320.	1.01	19.45	237	.02	.02	.00	229.
1.01	7.50	94	.07	.06	.01	323.	1.01	19.50	238	.02	.02	.00	214.
1.01	7.55	95	.07	.06	.01	326.	1.01	19.55	239	.02	.02	.00	199.
1.01	8.00	96	.07	.06	.01	328.	1.01	20.00	240	.02	.02	.00	186.
1.01	8.05	97	.07	.06	.01	330.	1.01	20.05	241	.02	.02	.00	173.
1.01	8.10	98	.07	.06	.01	332.	1.01	20.10	242	.02	.02	.00	162.
1.01	8.15	99	.07	.06	.01	334.	1.01	20.15	243	.02	.02	.00	151.
1.01	8.20	100	.07	.06	.01	336.	1.01	20.20	244	.02	.02	.00	141.
1.01	8.25	101	.07	.06	.01	338.	1.01	20.25	245	.02	.02	.00	131.
1.01	8.30	102	.07	.06	.01	340.	1.01	20.30	246	.02	.02	.00	123.
1.01	8.35	103	.07	.06	.01	342.	1.01	20.35	247	.02	.02	.00	123.
1.01	8.40	104	.07	.06	.01	343.	1.01	20.40	248	.02	.02	.00	123.
1.01	8.45	105	.07	.06	.01	345.	1.01	20.45	249	.02	.02	.00	123.
1.01	8.50	106	.07	.06	.01	346.	1.01	20.50	250	.02	.02	.00	123.
1.01	8.55	107	.07	.06	.01	347.	1.01	20.55	251	.02	.02	.00	123.
1.01	9.00	108	.07	.06	.01	349.	1.01	21.00	252	.02	.02	.00	123.
1.01	9.05	109	.07	.06	.01	350.	1.01	21.05	253	.02	.02	.00	123.
1.01	9.10	110	.07	.06	.01	351.	1.01	21.10	254	.02	.02	.00	123.
1.01	9.15	111	.07	.06	.01	352.	1.01	21.15	255	.02	.02	.00	123.
1.01	9.20	112	.07	.06	.01	353.	1.01	21.20	256	.02	.02	.00	123.
1.01	9.25	113	.07	.06	.01	354.	1.01	21.25	257	.02	.02	.00	123.
1.01	9.30	114	.07	.06	.01	355.	1.01	21.30	258	.02	.02	.00	123.
1.01	9.35	115	.07	.06	.01	356.	1.01	21.35	259	.02	.02	.00	123.
1.01	9.40	116	.07	.06	.01	357.	1.01	21.40	260	.02	.02	.00	123.
1.01	9.45	117	.07	.06	.01	358.	1.01	21.45	261	.02	.02	.00	123.
1.01	9.50	118	.07	.06	.00	359.	1.01	21.50	262	.02	.02	.00	123.
1.01	9.55	119	.07	.06	.00	360.	1.01	21.55	263	.02	.02	.00	123.
1.01	10.00	120	.07	.06	.00	360.	1.01	22.00	264	.02	.02	.00	123.

1.01	10.05	121	.07	.06	.00	361.	1.01	22.05	265	.02	.02	.00	123.
1.01	10.10	122	.07	.06	.00	362.	1.01	22.10	266	.02	.02	.00	123.
1.01	10.15	123	.07	.06	.00	363.	1.01	22.15	267	.02	.02	.00	123.
1.01	10.20	124	.07	.06	.00	363.	1.01	22.20	268	.02	.02	.00	123.
1.01	10.25	125	.07	.06	.00	364.	1.01	22.25	269	.02	.02	.00	123.
1.01	10.30	126	.07	.06	.00	365.	1.01	22.30	270	.02	.02	.00	123.
1.01	10.35	127	.07	.06	.00	365.	1.01	22.35	271	.02	.02	.00	123.
1.01	10.40	128	.07	.06	.00	366.	1.01	22.40	272	.02	.02	.00	123.
1.01	10.45	129	.07	.06	.00	366.	1.01	22.45	273	.02	.02	.00	123.
1.01	10.50	130	.07	.06	.00	367.	1.01	22.50	274	.02	.02	.00	123.
1.01	10.55	131	.07	.06	.00	367.	1.01	22.55	275	.02	.02	.00	123.
1.01	11.00	132	.07	.06	.00	368.	1.01	23.00	276	.02	.02	.00	123.
1.01	11.05	133	.07	.06	.00	368.	1.01	23.05	277	.02	.02	.00	123.
1.01	11.10	134	.07	.06	.00	369.	1.01	23.10	278	.02	.02	.00	123.
1.01	11.15	135	.07	.06	.00	369.	1.01	23.15	279	.02	.02	.00	123.
1.01	11.20	136	.07	.06	.00	370.	1.01	23.20	280	.02	.02	.00	123.
1.01	11.25	137	.07	.06	.00	370.	1.01	23.25	281	.02	.02	.00	123.
1.01	11.30	138	.07	.06	.00	370.	1.01	23.30	282	.02	.02	.00	123.
1.01	11.35	139	.07	.06	.00	371.	1.01	23.35	283	.02	.02	.00	123.
1.01	11.40	140	.07	.06	.00	371.	1.01	23.40	284	.02	.02	.00	123.
1.01	11.45	141	.07	.06	.00	372.	1.01	23.45	285	.02	.02	.00	123.
1.01	11.50	142	.07	.06	.00	372.	1.01	23.50	286	.02	.02	.00	123.
1.01	11.55	143	.07	.07	.00	372.	1.01	23.55	287	.02	.02	.00	123.
1.01	12.00	144	.07	.07	.00	373.	1.02	0.00	288	.02	.02	.00	123.
									SUM	33.41	31.84	1.57	187420.
										(849.)	(809.)	(40.)	(5307.14)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7875.	2029.	651.	651.	187354.
CMS	223.	57.	18.	18.	5305.
INCHES		25.44	32.62	32.62	32.62
MM		646.24	828.61	828.61	828.61
AC-FT		1006.	1290.	1290.	1290.
THOUS CU M		1241.	1592.	1592.	1592.

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	465.50	465.50	469.10
STORAGE	176.	176.	273.
OUTFLOW	0.	0.	170.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	468.71	0.00	262.	129.	0.00	18.08	0.00
.15	469.62	.52	288.	321.	3.33	16.42	0.00
.20	470.18	1.08	305.	843.	4.08	16.08	0.00
.25	470.53	1.43	316.	1380.	5.00	16.00	0.00
.30	470.73	1.63	322.	1870.	5.83	15.92	0.00
.35	470.90	1.80	327.	2254.	6.42	15.92	0.00
.40	471.02	1.92	331.	2823.	7.00	15.92	0.00
.50	471.22	2.12	337.	3410.	7.75	15.92	0.00
1.00	472.39	3.29	374.	6808.	11.75	15.92	0.00

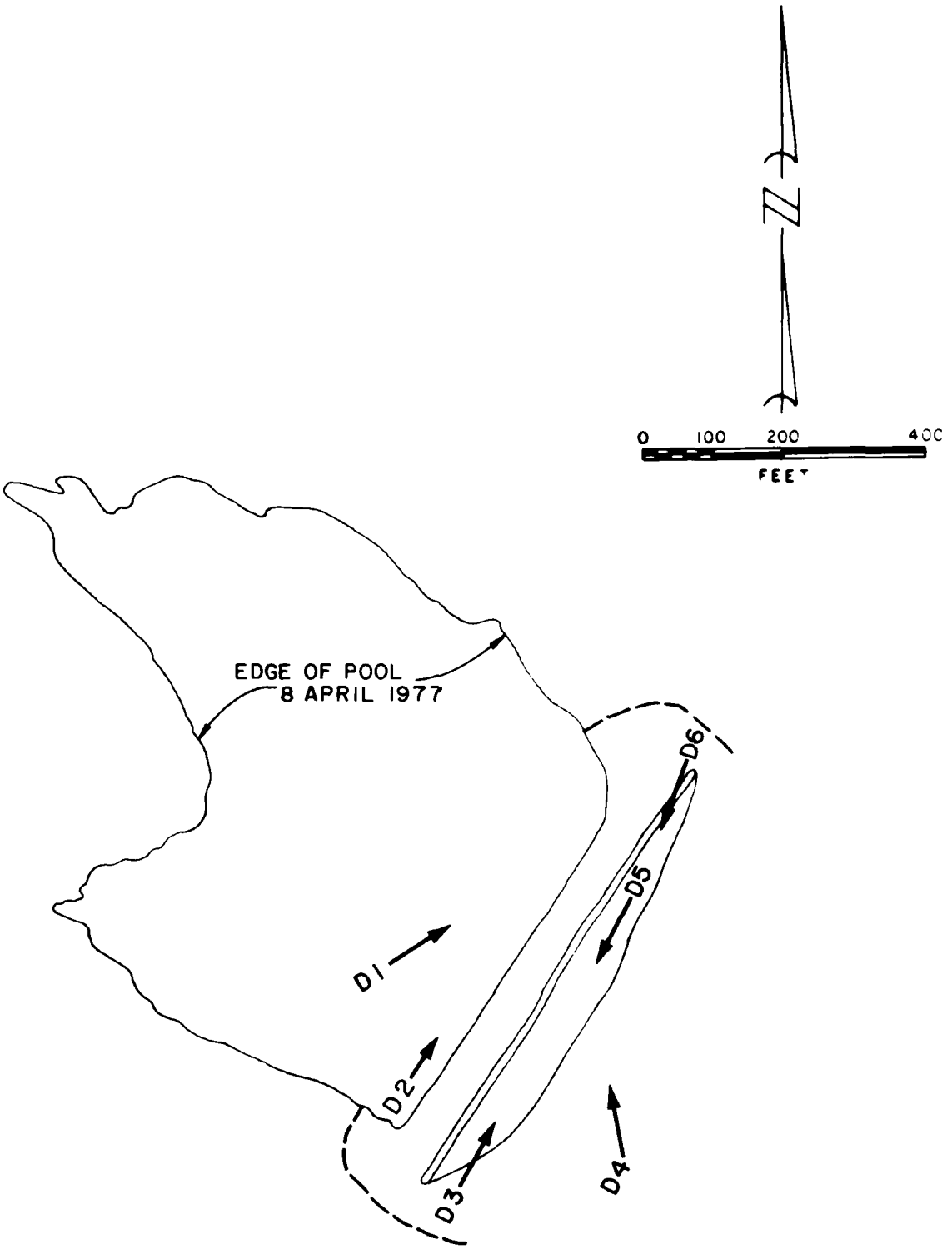


PHOTO INDEX I
FOR
DAM

LAKE VIRGINIA DAM
JEFFERSON COUNTY, MO.
NOVEMBER 1978

PREPARED BY
REITZ & JENS, INC

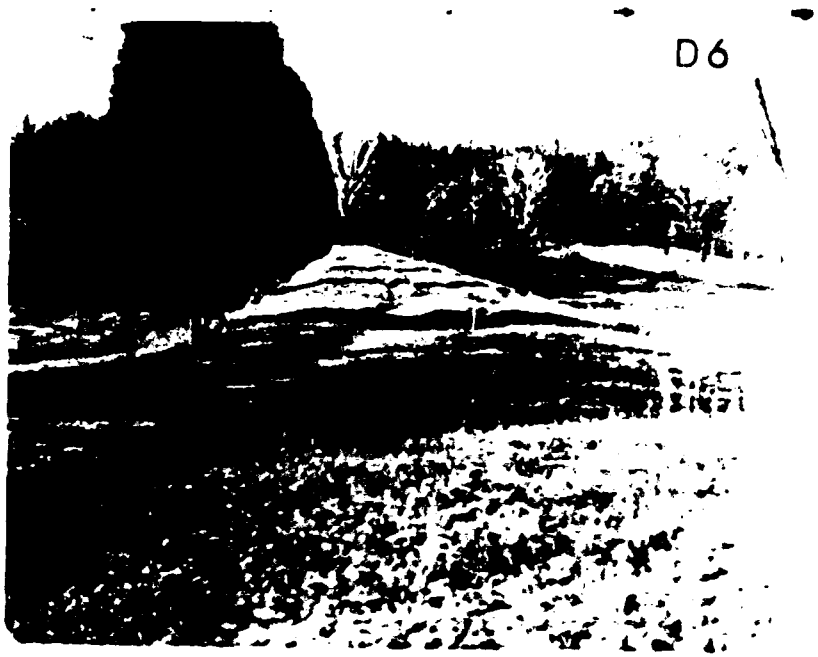
D1

D2

D4

DAM


D5


D6

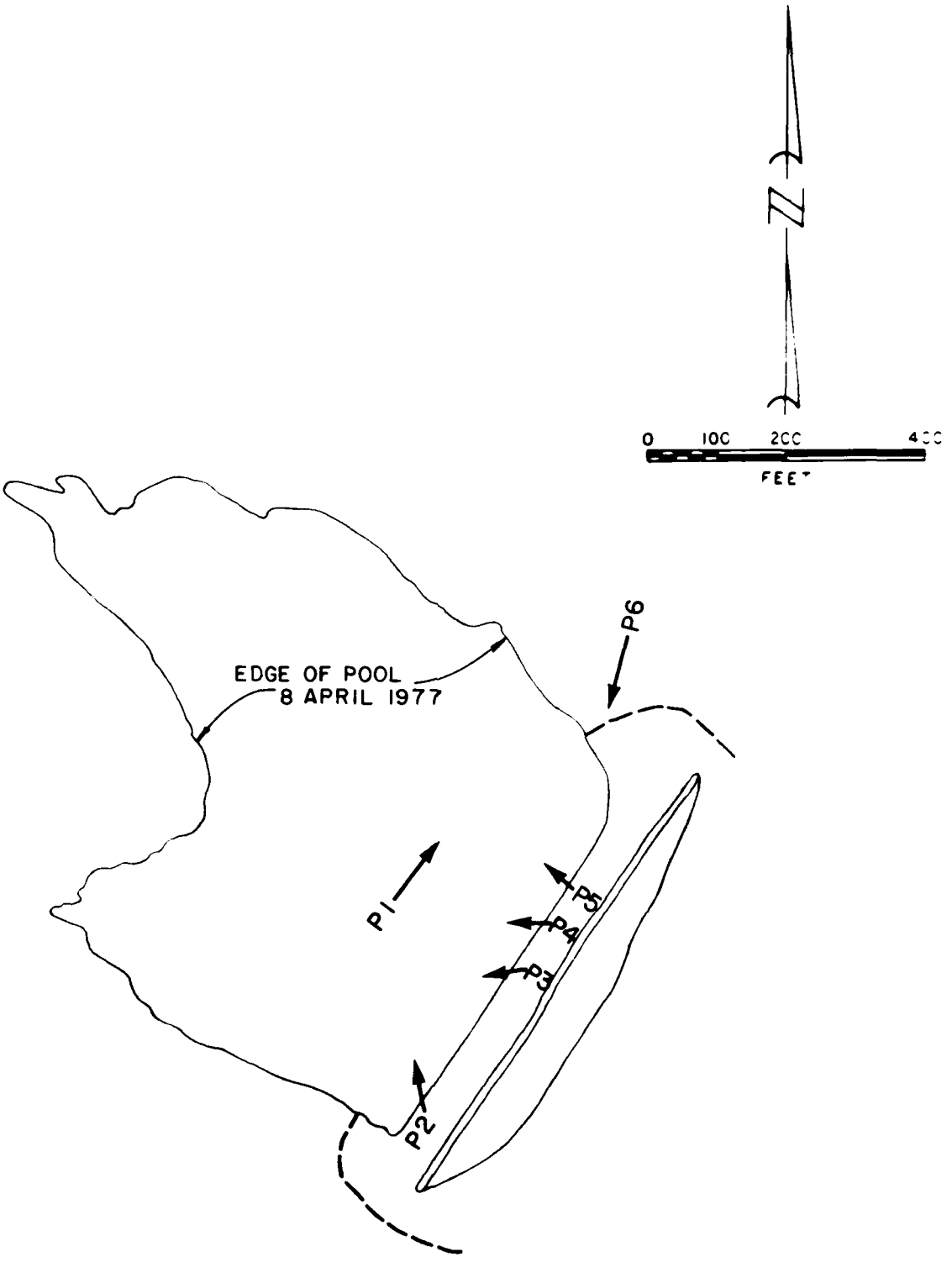


PHOTO INDEX 2
FOR
PANORAMA

LAKE VIRGINIA DAM
JEFFERSON COUNTY, MO.
NOVEMBER 1978

PREPARED BY
REITZ & JENS, INC

P1

P2

P3

P4

PANORAMA

P5

P6

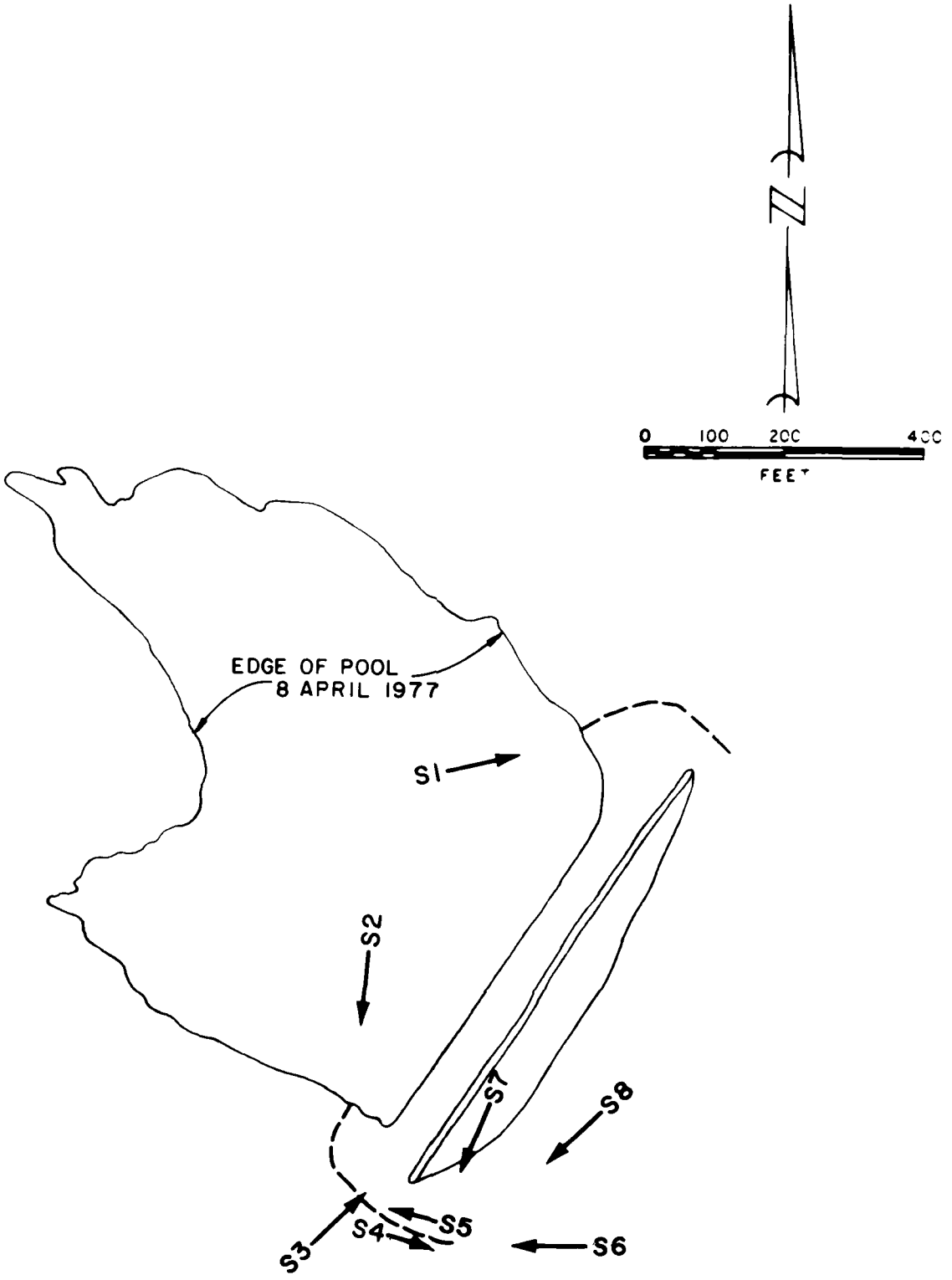


PHOTO INDEX 3
FOR
SPILLWAY

LAKE VIRGINIA DAM
JEFFERSON COUNTY, MO.
NOVEMBER 1978

PREPARED BY
REITZ & JENS, INC

SPILLWAYS


S1


S2


S3


S4


S5


S6


S7


S8

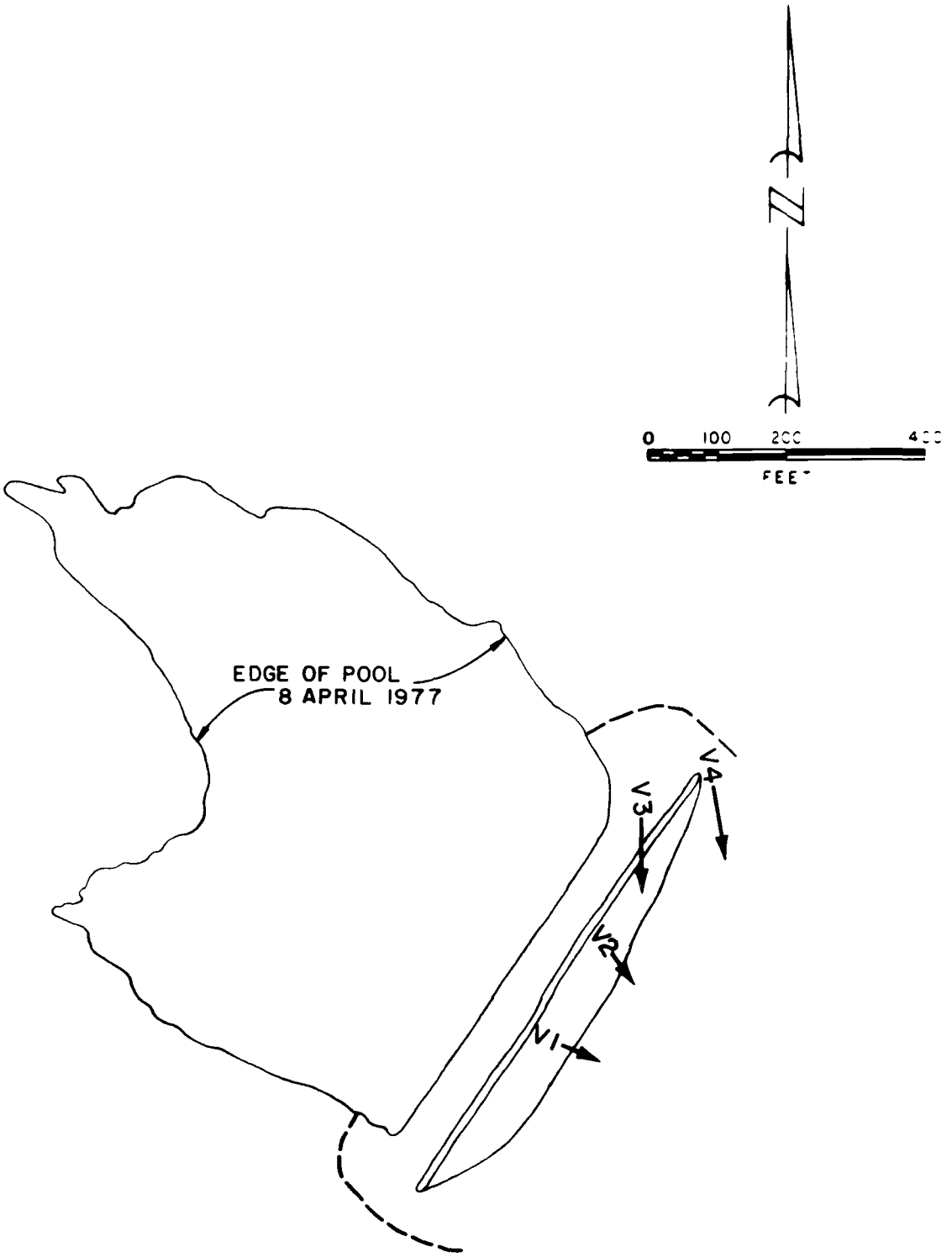
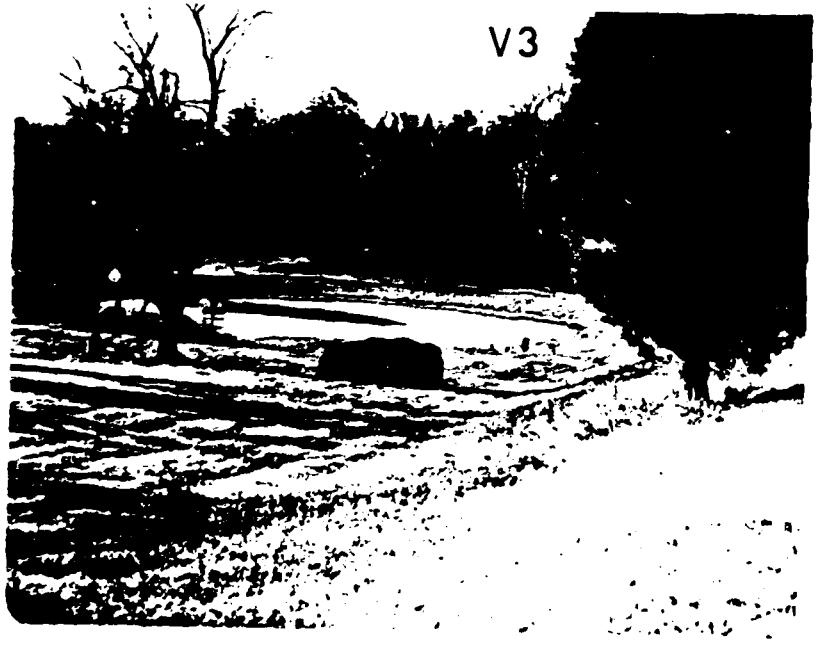


PHOTO INDEX 4
FOR
VALLEY BELOW DAM

LAKE VIRGINIA DAM
JEFFERSON COUNTY, MO.
NOVEMBER 1978

PREPARED BY
REITZ & JENS, INC



VALLEY BELOW DAM

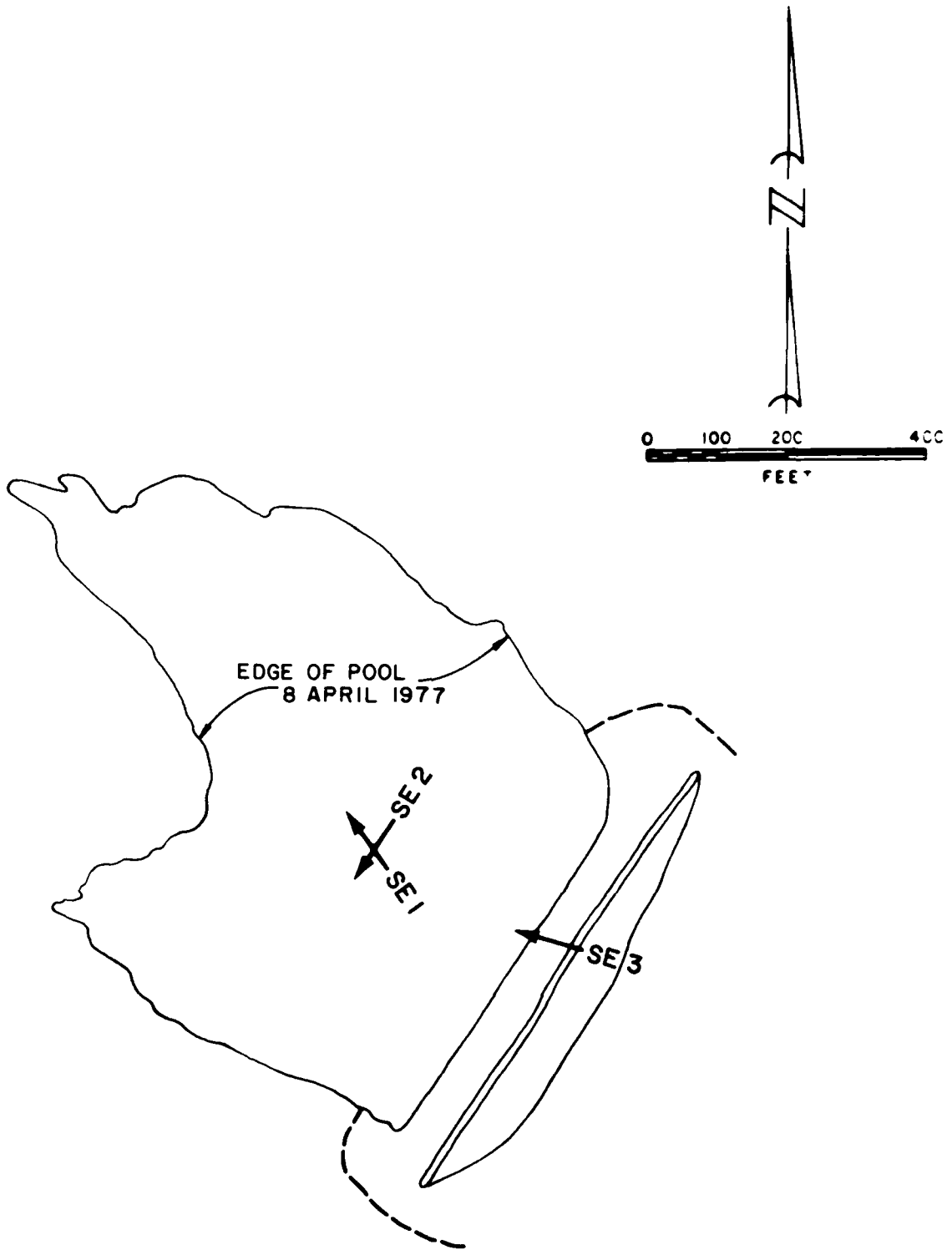


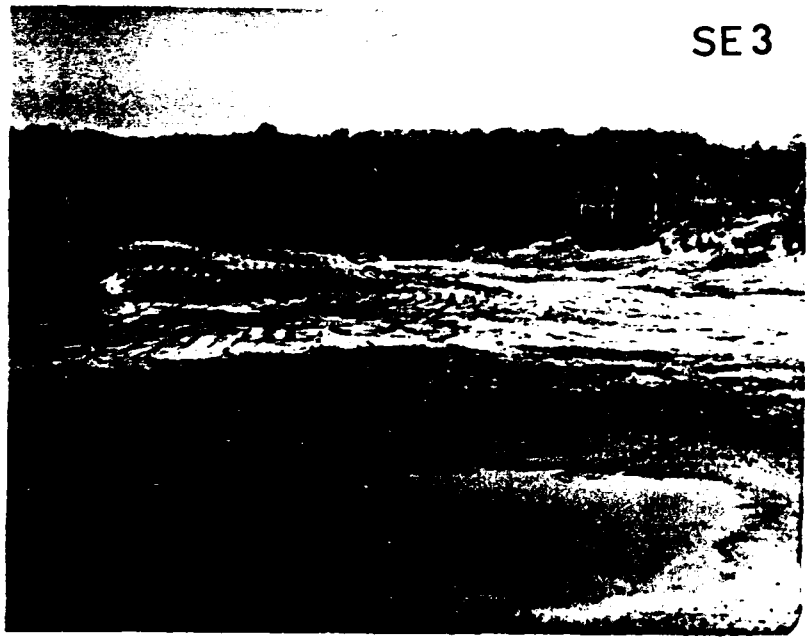
PHOTO INDEX 5
FOR
SEEPAGE

LAKE VIRGINIA DAM
JEFFERSON COUNTY, MO.
NOVEMBER 1978

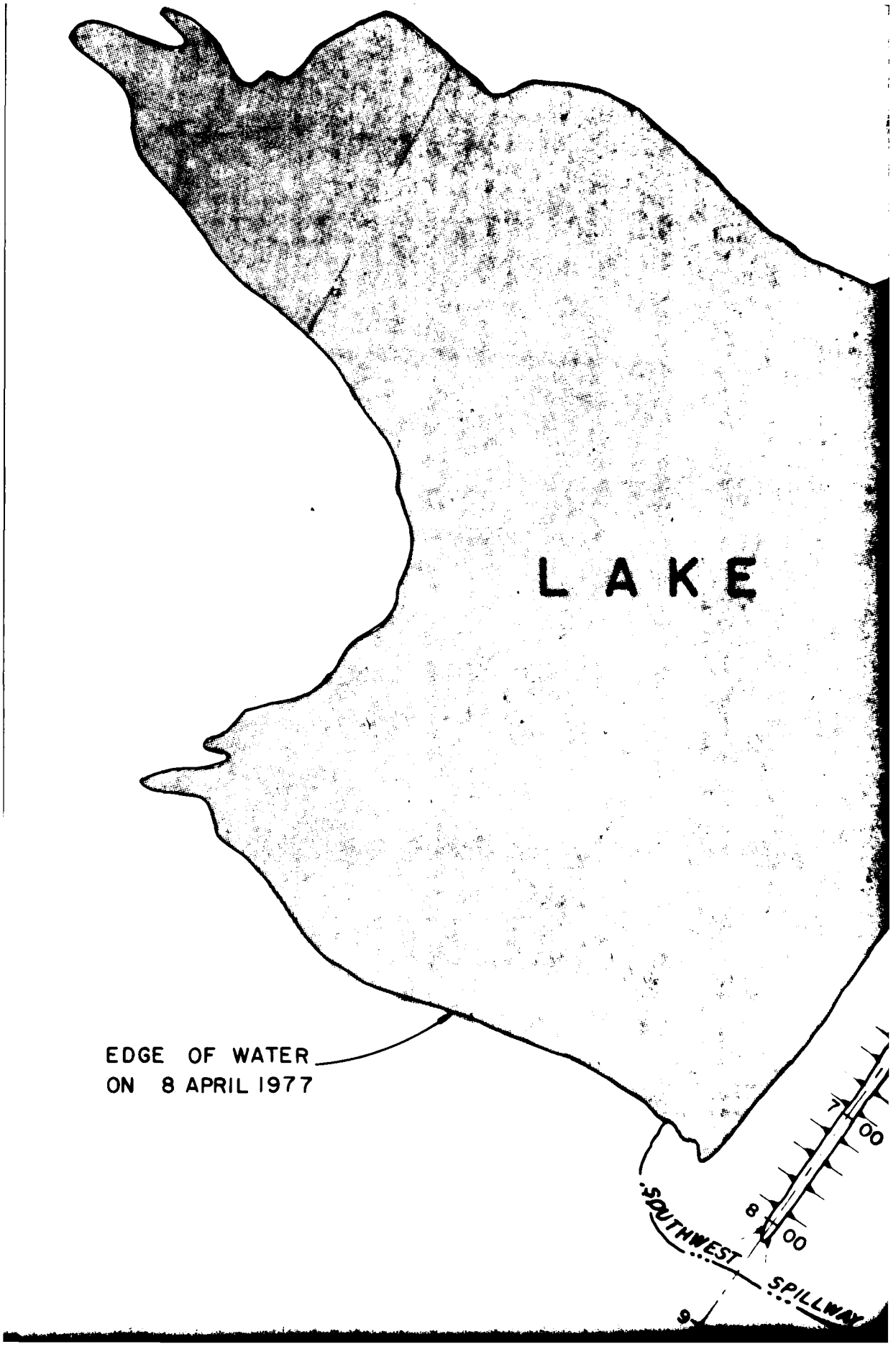
PREPARED BY
REITZ & JENS, INC.

SE 2

SE 3



SEEPAGE


LAKE
EDGE OF WATER
ON 8 APRIL 1977
SOUTHWEST SPILLWAY
7 00
8 00
9

0

2

NORTHEAST SPILLWAY
0 00
00
1
2 00
3 00
4 00
5 00
6 00
7 00
8 00
SOUTHWEST SPILLWAY
9 00
K E
N

3

N

PLAN OF LAKE

0 100 200 400FT.

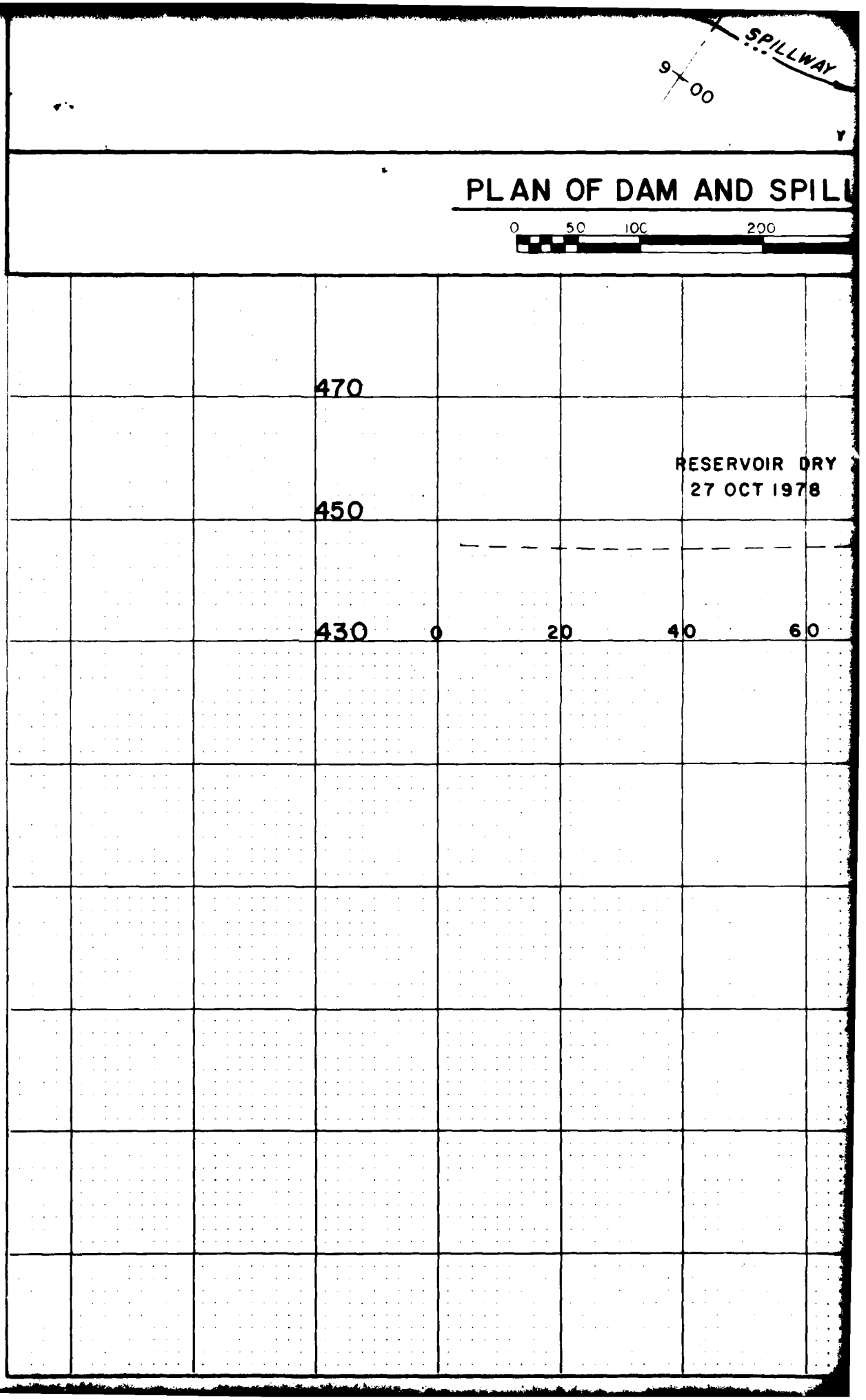
4
Creek
Creek
WA

WATERSHED AND OUTFLOW CHANNEL

5

N

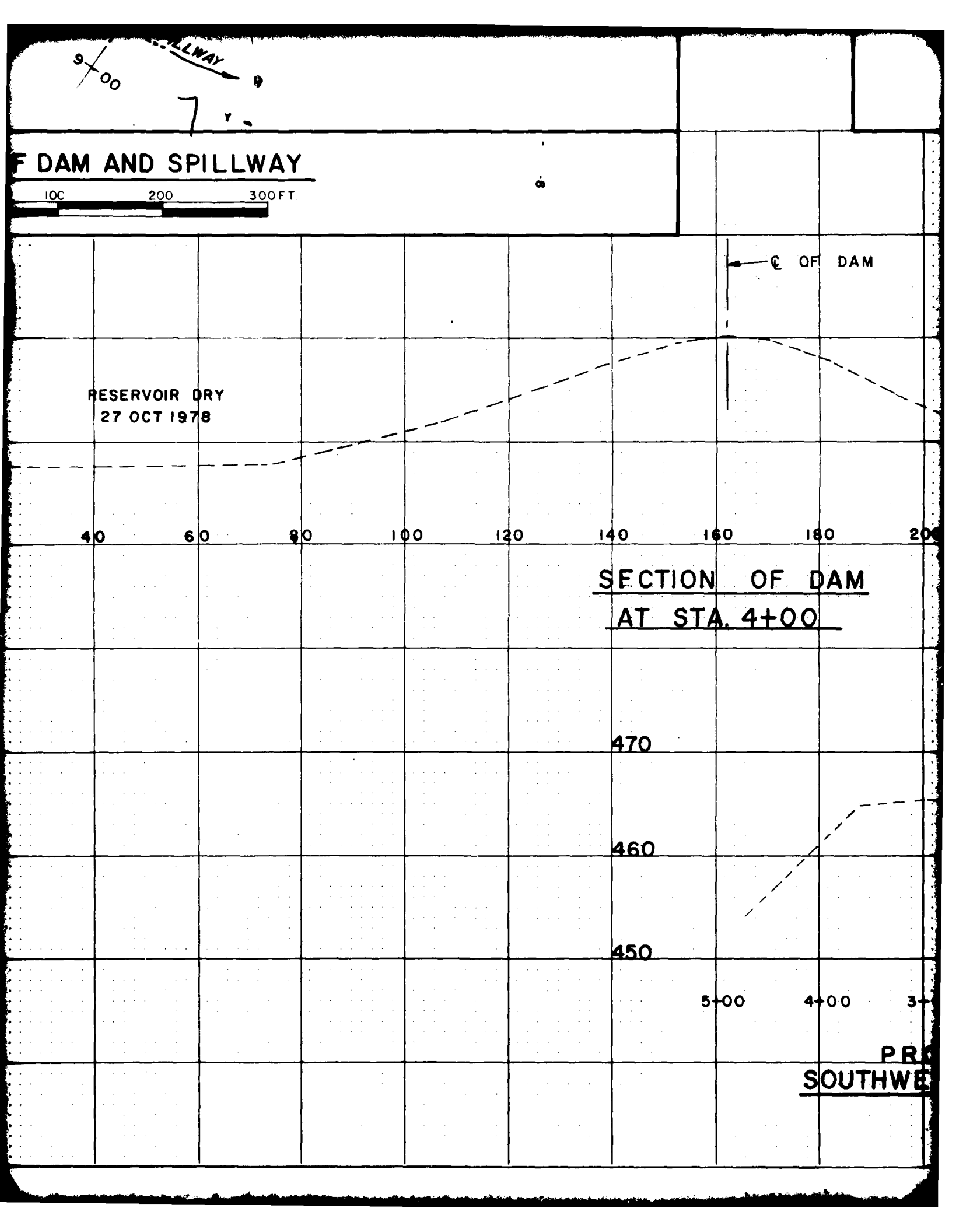
6



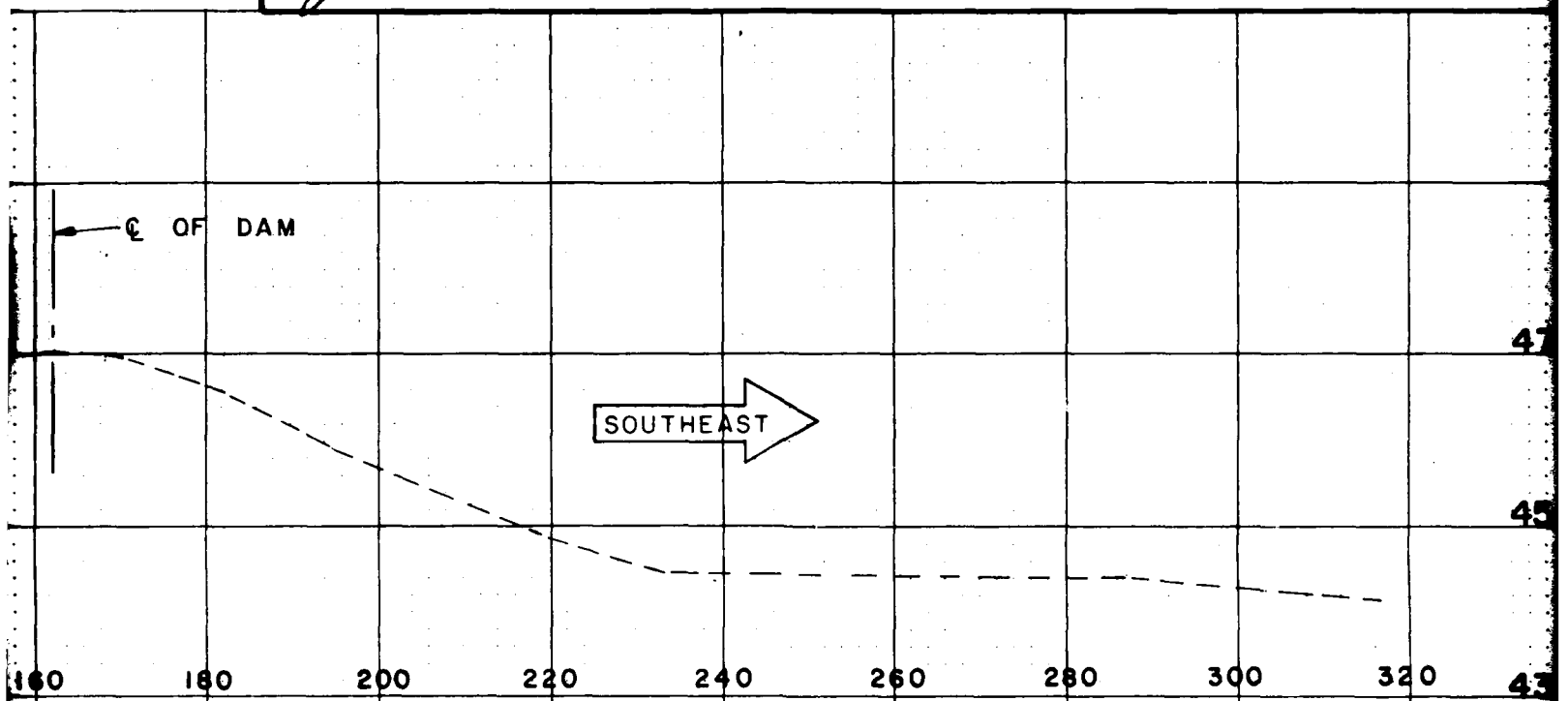
ORIGINAL SURVEY

NOTE BOOK NO.

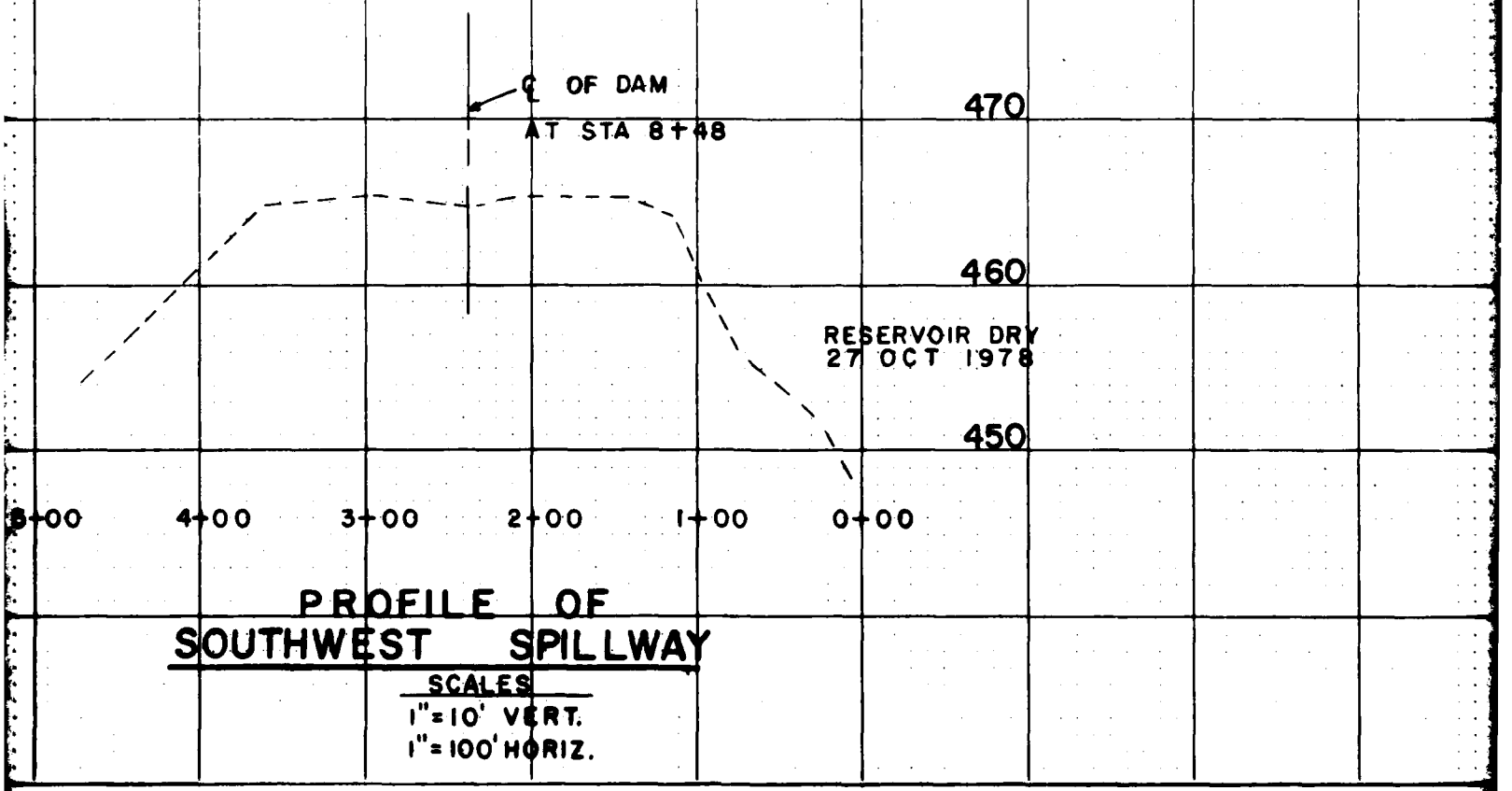
	BY	DATE
SURVEYED		
PLOTTED		
TEMPLATE		
AREAS		
AREAS CHECKED		


9+00
F DAM AND SPILLWAY
100
200
300 FT.
℄ OF DAM
RESERVOIR DRY
27 OCT 1978
40
60
80
100
120
140
160
180
SECTION OF DAM
AT STA. 4+00
470
460
450
5+00
4+00
SOUTHWE

DATE OF PHOTOGRAPH
8 APRIL 1977



N OF DAM
'A. 4+00



PROFILE OF
SOUTHWEST SPILLWAY

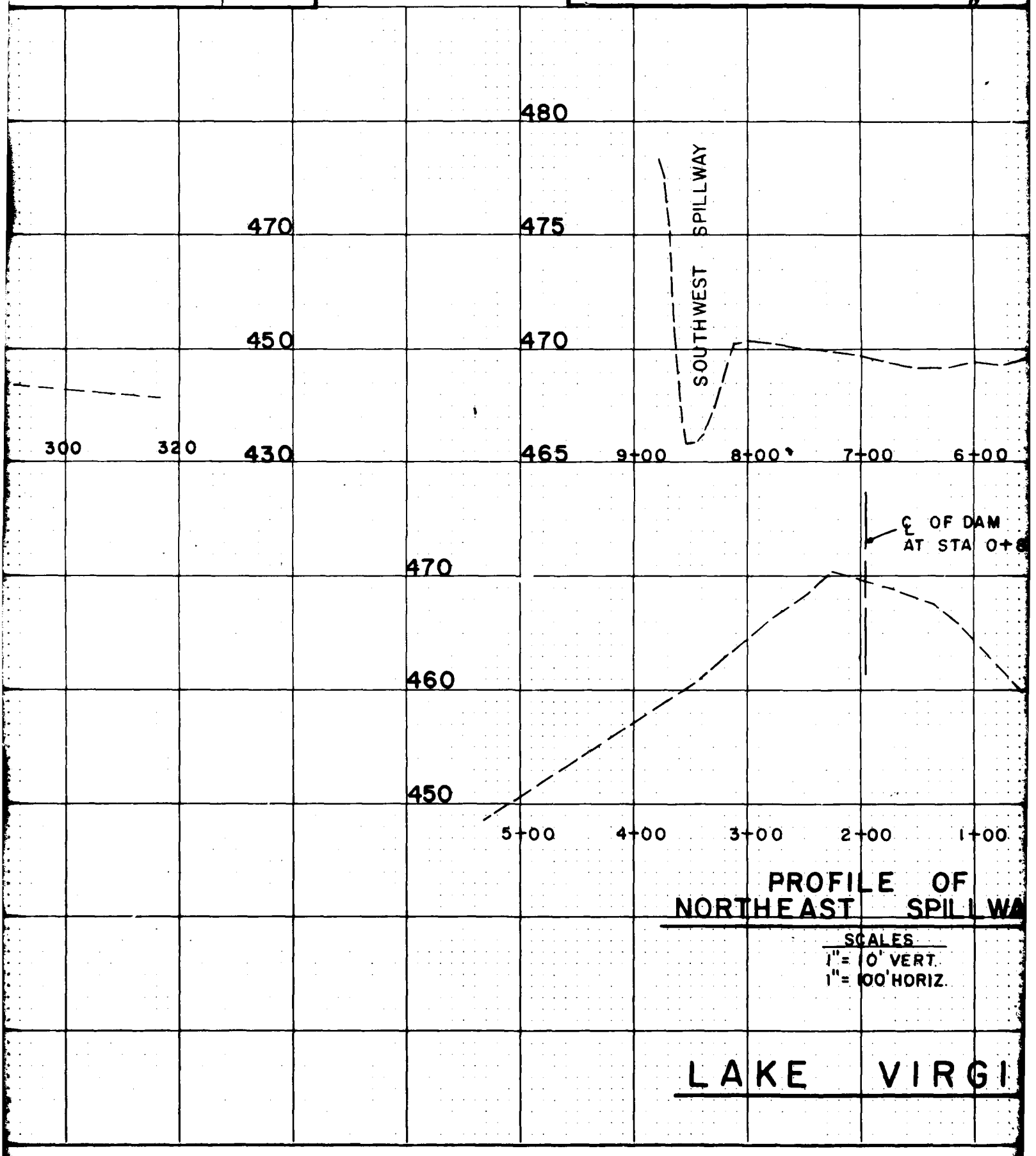
SCALES
1"=10' VERT.
1"=100' HORIZ.

HIGHWAY FEDERAL AID SHEET
PLATE 4-SINGLE PLAN AND CROSS SECTION-LINE & DOT

9

WATERSHED AN

0 1000 200



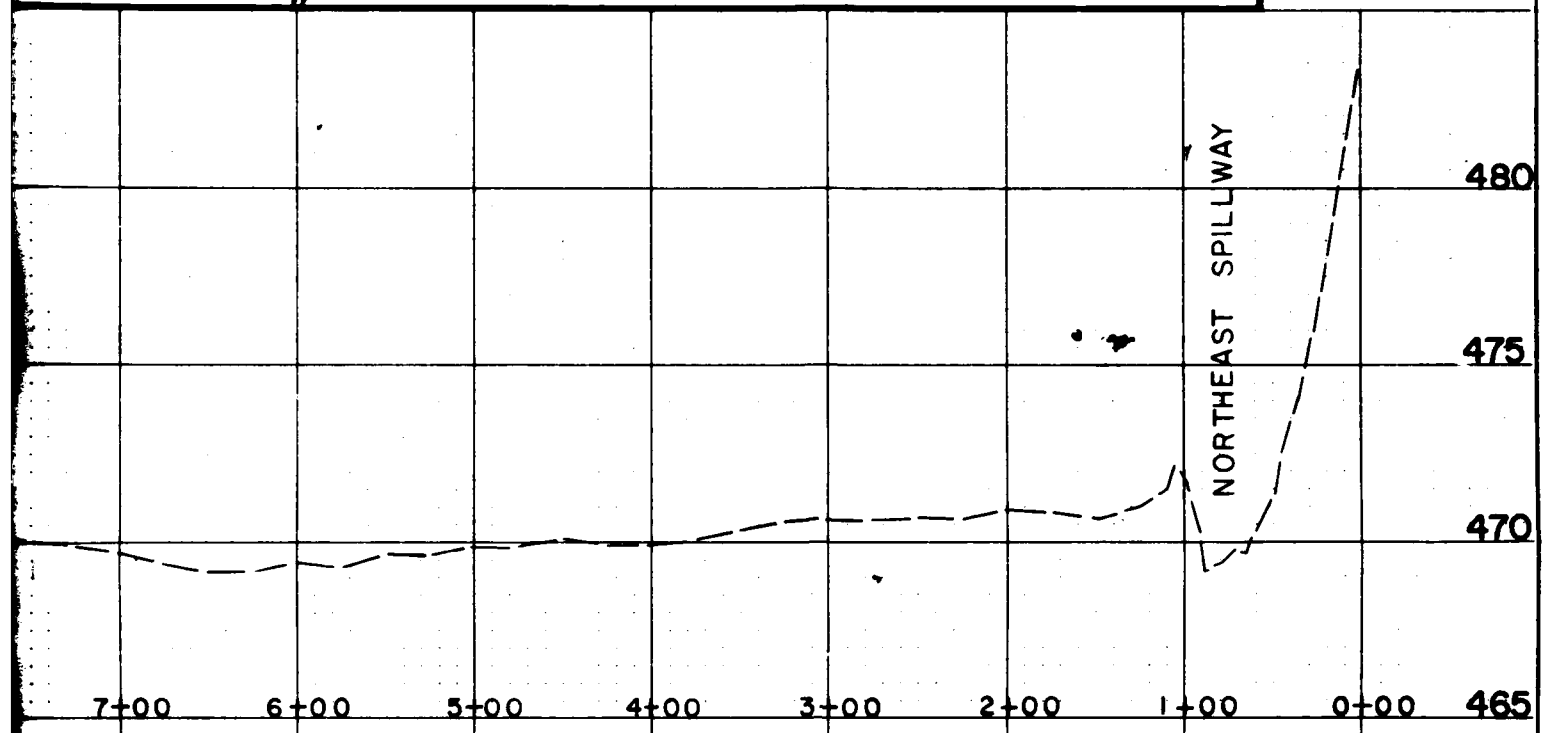
PROFILE OF
NORTHEAST SPILLWA

SCALES
1" = 10' VERT.
1" = 100' HORIZ.

LAKE VIRGI

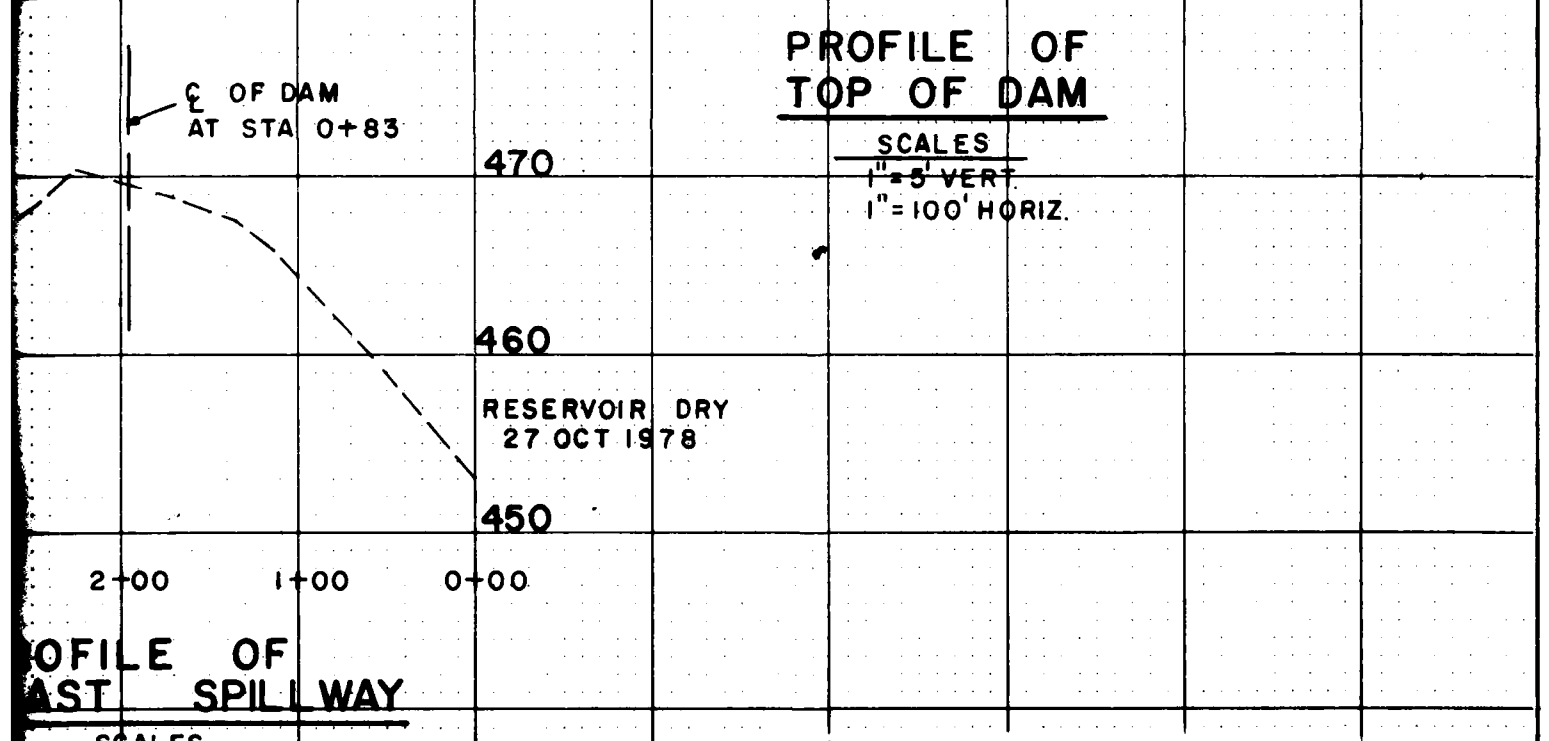
WATERSHED AND OUTFLOW CHANNEL

0 1000 2000 4000 6000 FT.



PROFILE OF TOP OF DAM

SCALES
1" = 5' VERT.
1" = 100' HORIZ.



OFILE OF AST SPILLWAY

SCALES
1" = 10' VERT.
1" = 100' HORIZ.

VIRGINIA

PHASE I — INSPECTION

COUNTY I.D. NO. 099
JEFFERSON COUNTY, MISSOURI

INVENTORY NO. I. D. 30425

FOR ST. LOUIS DISTRICT, CORPS OF ENGINEERS

REITZ & JENS, INC
CONSULTING ENGINEERS

ST. LOUIS, MISSOURI
DECEMBER 1978